The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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Democracy Acts

JUST over a quarter of a century ago the Germans started the first Great War by invading Belgium. The decisive day was August Bank Holiday. The measures which the British Government at that time thought necessary for coping with the crisis at home amounted virtually to an extension of that Bank Holiday for several days. The banks were reduced to comparative inactivity by the declaration of a moratorium; the Stock Exchange was temporarily closed; business in general was largely in suspense until the national outlook had been re-adjusted to the conditions of war.

How different has been the experience of Whit Monday, 1940, at the height of the tremendous crisis evoked by the second German invasion of the Low Countries. Instead of financial and commercial operations being in temporary suspense, they were intensified to the maximum point. The Government cancelled the Bank Holiday, and business went on as usual. The banks and the Stock Exchange functioned as in a normal period, and millions of workpeople throughout the country responded with a will to the call of their leaders to report for duty, not only in establishments concerned with the manufacture of war material, but in workshops and factories at large.

This sacrifice of one of the traditional public holidays was made, so far as can be ascertained, without a grumble. The main reason advanced by the Government for this drastic measure was that it was necessary to save transport for military and other public purposes. While fully appreciating the strength of this argument, there can be no doubt whatever that the great mass of men and women who put in a day's work on Whit Monday thought more of the silent contribution they were making in support of the national effort in an unexampled emergency. It must be remembered that the Government's writ could only run a certain distance. A considerable part of this splendid demonstration was purely voluntary. There was no dragooning, as is usual in Germany, with the result that the output was almost certainly greater in quantity and higher in quality.

Simultaneously the capacity of the democratic system to adapt itself to any requirements, however grave, was never better exemplified than in the changes of Government made under pressure of one crisis, but actually carried out in face of another and still greater one. It became abundantly clear last week that public opinion had crystallised into a demand for three changes in principle. It wanted the Opposition parties to take their share of responsibility for the conduct of the war. Secondly, it was anxious to see some new men among the war leaders. Finally, it was in favour of a War Cabinet more on the pattern of Mr. Lloyd George's in 1916-18 than of Mr. Chamberlain's, small in numbers and divorced, as far as possible, from departmental routine.

All three changes were, in fact, made possible by the magnanimity and fine public spirit of Mr. Chamberlain. He had a substantial majority in the House of Commons, and it is arguable that he could have carried on as before at least through the first weeks of the critical period initiated by the invasion of the Low Countries. He took the bolder course of sacrificing himself at once and the manly and patriotic line of agreeing to render whatever service a former subordinate asked of him. His action, unique in British political annals, was one for which his fellow-countrymen should be ever grateful. It enabled the transition of the premiership to Mr. Churchill to be effected in so easy and natural a way as to make ridiculous the common totalitarian gibes at the failure of the democratic system to act with swiftness and energy in a crisis.

After one of the most memorable premierships of modern times, Mr. Churchill finds himself placed in the highest position under the Sovereign amid every mark of popular goodwill and support. As things shaped themselves, it can hardly be questioned that Mr. Churchill was made Prime Minister by public opinion. He is a great parliamentary figure and a grand fighter, and the business community will be proud to follow him on the path which all hope he may succeed in carving to victory. Some of his appointments to high office are possibly not those which the industrial and commercial leaders would have made if the choice had been theirs. They recognise, however, a welcome accession of strength and determination among the new faces in the Ministry. While Sir Andrew Duncan remains at the Board of Trade, there is a new Minister of Supply in Mr. Herbert Morrison. The London Labour leader assumes an immense responsibility, but he is assured of the heartiest co-operation of the varied interests with which he will come into contact.

Still, there can be no other test of the new Government than its ability to conduct the war successfully. These are stern times, and call for stern judgments. That Mr. Churchill and his new colleagues will earn the thanks of mankind by ridding the world of Hitler and all his works is the devout hope of their fellow-citizens in all parts of the Empire.

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NOTES AND COMMENTS

Chemicals and the New Invasion

THE full repercussion of the German invasion of Holland and Belgium on the British chemical industry is as yet difficult to assess. Farsighted importers, dealing in the products of Dutch and Belgian manufacture which have no counterpart in this country, have laid in good stocks, and supplies of potassium carbonate and hydroxide originating from the Low Countries are still available. Many of the Belgian factories are perilously near what is now the front line, but if the German advance is halted or rolled back it may well be possible to continue dealing in these products of our new allies. Imports of certain other materials, however, which are manufactured also in this country, have perhaps been too great in the immediate past, and users of these will now very properly have to rely on the home-produced article. Nevertheless, putting the immediate necessities of war economy on one side for the moment, every chemist must deplore the ruthless barbarity that has dislocated the peaceful trading activities of Holland and has overrun with fire and sword the busy industrial area round Liége. It is only a few weeks since we recorded the initiation of calcium carbide manufacture in Amsterdam, and depicted a new methane-cracking plant at Remory, behind the Liége forts. The wastage of war appears more lunatic to the scientific mind than perhaps to any other.

Scrap Metal in Chemical Industry

SCRAP of any kind is regarded by most people as a wasteful but unfortunately prevalent feature of all processes, be they domestic or industrial. Scrap metal has always been considered in this light by manufacturers, but in war time its importance cannot be over-rated. The Iron and Steel Control is at the moment conducting a nation-wide campaign for scrap iron and steel in an attempt to rid industrialists of the impression that the scrap metal lying about their yards and factories is of little importance. Its collection is of paramount importance. It has been stated that one ton of scrap will in effect produce three tons of carrying capacity for food, raw materials, etc., in our ships, and this equals three and a half voyages per year. Behind this statement lies the main reason for scrap collection. When there is a plentiful supply of home-produced scrap the importation of scrap from abroad would make an unnecessary demand on shipping space. As one of the country's largest and most important industries, the chemical industry can play a prominent part in helping to meet this demand for scrap metal. The rapid manner in which vessels and plant are supplanted by either new designs or by the needs of new processes makes the industry a prolific source of scrap metal supply.

Chemical Manufacture in India

TIMELY suggestions for helping the chemical industry of India are contained in the report of the Drug Sub-Committee of the Bengal Pharmaceutical Association. It has recommended that the Government should take steps for proper and scientific collection, cultivation and curing of vegetable drugs, suggesting at the same time the introduction of more important medicinal plants to the country. Another notable suggestion is that basic drugs and chemicals, solvents, apparatus and appliances, which are essential for the manufacture of pharmaceuticals and chemicals, should be introduced. The Indian manufacturers' grievances regarding excise duty on solvents, transport, etc., have been detailed by the Association's committee, who urge the Government to encourage the establishment of new and basic drug, chemical and allied industries, and to provide protection against foreign competition. The sub-committee's informative list details the drugs and medicines that are cultivated or manufactured in India at present with Indian raw materials, those that can be cultivated or manufactured under present emergency conditions and which till now had to be imported from abroad, and those that are not available in India at present, but can be replaced by suitable and effective substitutes.

Sodium Sulphide Production Processes

SODIUM sulphide with an extremely low iron content is now manufactured in Italy by processes, first put forward some 20 years ago by Professor Livio Cambi, involving the use of high-temperature electric furnaces. Two processes now operating successfully are discussed by R. Battistoni in *La Chimica e L'Industria* (March, 1940). In the first the electric furnace is used to reduce barium sulphate to barium sulphide, the latter being then reacted with sodium carbonate when sodium sulphide is formed in solution and can be concentrated (after filtration from barium salt) to the 60/62 per cent. grade with the aid of the hot gases from the furnace. In the second, and now more interesting, process, sodium sulphate is heated in the electric furnace with coal to form sodium sulphide and carbon dioxide. Complications then ensue, however, because sodium sulphide and unchanged sulphate react to give sodium monoxide and sodium polysulphide, sodium monoxide reacts in turn with carbon dioxide to yield sodium carbonate and the latter is finally (according to Cambi) reduced to metallic sodium, which converts the polysulphide into ordinary sulphide, but only at a much higher furnace temperature than is required for the sodium sulphate reduction. These undesirable secondary reactions can be avoided either by adding sodium bisulphate to the initial fused mass so as to destroy the sodium carbonate immediately on formation, or by adding sodium polysulphide which likewise rapidly decomposes the carbonate. In either case the final solution of sodium sulphide can be purified by treatment with barium sulphide and separation of insoluble barium salts by filtration as in the first process.

THE POTATO PRODUCTS INDUSTRY—II.

Starch Preparation—Dextrine Manufacture

FROM A SPECIAL CORRESPONDENT

(*Continued from page 269, "The Chemical Age," May 11*)

THE removal of the potato starch from the pulpy mass leaving the grinding mills is accomplished by means of extracting sieves, which may be of two different types; either a rotary cylindrical pattern, or the reciprocating type. One of the latter, illustrated in Fig. 5, has an outer casing of oak, with removable sieves in fir frames. The sieves are easily removed by unscrewing a clamp at each side. This reciprocating sieve is carried on flexible steel supports from the floor, and is an improvement on the older design in which the supports were from the ceiling, in that more working space over the sieve is available. An attachment at one end is connected to the eccentric which imparts the necessary vibratory motion. Generally two or more of these sieves are employed, the first one being equipped with brushes to assist the passage of the starch through the sieve. The sifting surface of the preliminary separator is composed of sectional wire gauze of about 40 mesh. A strong jet of water plays on the surface to assist the washing out of the starch, the jets being of narrow orifice to prevent very weak starch liquors being created from using an excess of water. In the second separator brushes are not commonly used, and the sieves are either of very fine wire gauze or of silk of about 80 to 90 mesh. A third sieve is often employed with a mesh of about 100 or more. The exhausted pulp from the sieves, after a thorough washing to recover residual starch, is filtered from excess water and used as a cattle food. All the starch liquor passing the final separator is run into washing vats, rectangular, cement-lined, brickwork structures, provided with efficient stirrers. In the side of each vat, a few feet from the bottom, a swing-suction outlet line is fixed, through which the upper layers of water and soluble impurities may be removed.

The object in purification is to rid the starch of residual fibre and remaining water-soluble impurities, derived from the potatoes, as quickly as possible; for if these are left in contact with the starch they rapidly cause decomposition. To remove water-insoluble impurities certain chemical agents, such as sulphites, hypochlorites, etc., are frequently added to the liquor in the vat. The dissolving out of the albuminous matter is assisted by the addition of several per cent. of sulphurous acid. This is used both in the gaseous (SO_2) and the liquid (H_2SO_3) state, the former having the more energetic action. A sulphur burner is used for the production of the gas, in which the necessary air supply is provided by a rotary blower; the hot SO_2 gas produced is cooled before entering the starch-washing vats by passing through a system of pipes immersed in running water. These pipes act also as a trap for the particles of sulphur carried over from the furnace, which are readily cleared out of the system at intervals by unscrewing threaded plugs at the end of each pipe. The sulphur burner has a safety valve, to divert the gas to a tank of water should the pressure rise unduly through sudden closing of the valves supplying the vats.

After a vigorous agitation with these chemical agents the starch is allowed to settle and the impurities run off, when the starch is again washed with water alone. The removal of the excess water and final purification is most expeditiously carried out by centrifuges, which lower the water content to about 45 per cent. and simultaneously separate any residual fibre which may have passed all the previous sieves. Mechanical dehydration being much cheaper than thermal drying, with an efficient centrifugal machine the time required in the dryers may be much curtailed. A machine of the continuous type is usually employed, in which a starch suspension of about 1.115 sp. gr. is fed to the apparatus, the drained starch being continuously removed by a worm conveyor. This machine has a perforated drum, covered first with a layer of fine silk over which is a layer of filter cloth, and as the starch milk is fed to the machine it is pressed by centrifugal force against the walls of the drum, the surplus water passing through the cloth and out of the machine to waste. Owing to the difference in specific gravity of the fibre and starch any fibre present forms a separate layer and, by means of scraper blades operating at different depths in the deposited starch layer, it is possible to separate the pure starch from the fibrous starch, the latter going back to the grinders and sieves for further treatment.

Starch Drying

The drying of potato starch has until recently been carried on by more or less primitive methods, including many variations of the tray drying system in old fashioned "stoves." Both band dryers and the rotary type of cylindrical dryer are also in use, but probably one of the best methods is represented by a plant, Fig. 6, originally developed by a German firm, and now built in this country by The Buell Combustion Co., Ltd. In this dryer the starch is spread out

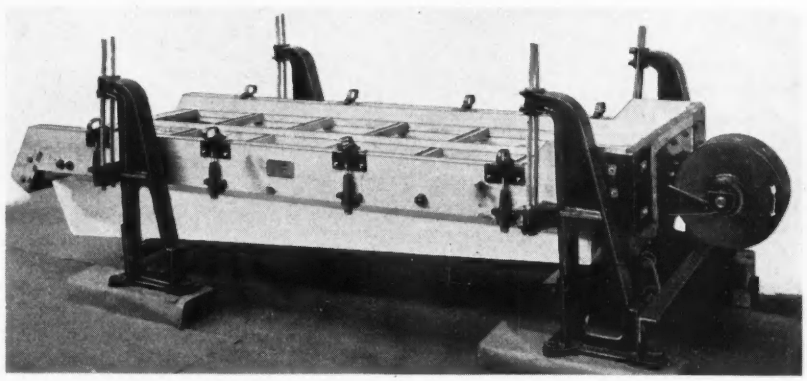

Fig. 5. Reciprocating Sieve for Potato Starch Manufacture.

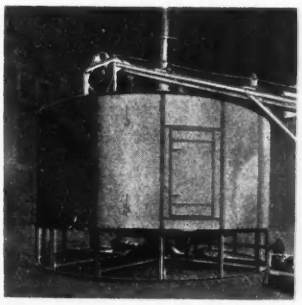

Fig. 6.
Buell Vertical Turbo-Dryer.

in a thin layer on a series of circular shelves, arranged one above the other, which slowly rotate. Each of the shelves is divided into several segments in such a way that between every two sections there is a gap for the delivery of the starch from one shelf to the next below. A special feeder spreads the starch in a uniform layer upon the uppermost shelf. During one revolution of the dryer the starch remains stationary, exposing a large evaporation surface. Before the rotary shelf returns to the point where the feed is situated a scraper knife deflects the material through the gap on to

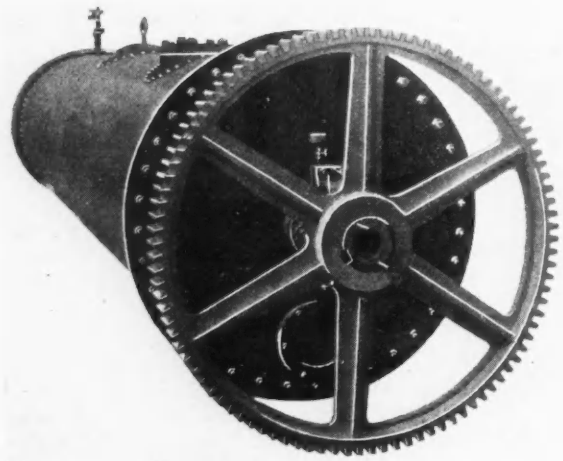

Fig. 7. Dextrinising Vessel.

the circular shelf so as to expose a large evaporation surface again. This process is repeated according to the number of shelves installed until the starch finally arrives at the lowest shelf, from which the dried product is delivered through the discharge opening. A full revolution of the shelves requires approximately 2 to 5 minutes according to the drying time required, which period is based upon the moisture content of the starch entering the dryer and the final moisture content desired. The rotary system of annular shelves is ventilated by turbines, arranged in the centre of the system and mounted on a common shaft, which impart a spiral motion to the air in the drying chamber. During the drying operation the air passes in alternating directions over the starch and on its passage, before touching the starch again, it is reheated by the heating elements inserted in the circuit. The fresh air enters continuously at the bottom of the dryer and a corresponding quantity of exhaust air is discharged through the central opening in the top. The drying chamber is divided into three drying zones arranged one above the other, each with a different air temperature. A cooling zone for the dried starch may be added to the lower part of the dryer without any alteration of the general design of the plant. The speed of the drying machine is so arranged that the dried starch has a moisture content of between 14 and 16 per cent. There would be no point in further drying unless the dried material is to be immediately packed into air-tight containers, for it slowly absorbs atmospheric moisture until it contains about 16 per cent. It is interesting to note in connection with anhydrous starch that a method for maintaining it in the dry state has recently been protected (B.P. 516,588). According to this patent stable anhydrous starch is obtained by removing practically all water by heating out of contact with air and thereafter treating with 5 to 25 per cent. of a solvent inert to starch, such as carbon tetracloride, the solvent being expelled by volatilisation before using the starch.

The technical qualities of potato starch receive no further treatment in the starch works after drying, but for farina manufacture it is necessary to put the dried product through sifting and dressing machines similar to those used in the wheat flour industry.

Potato Dextrine

While a large proportion of dextrine is manufactured from good quality potato starch, much of it is produced from the various "off grades" of this starch, *e.g.*, starch showing signs of mould or mildew from fibre or other impurity, starch discoloured by overheating during drying, gelatinised starch, etc. From the theoretical standpoint dextrine consists of a group of well defined substances, all having the formula $(C_6H_{10}O_5)_x$, and comprising amylo-, erythro-, and achroodextrins. These three dextrins can be recognised by their different colour reactions with iodine, *viz.*, violet, red and yellow respectively. In practice, however, a commercial sample consisting entirely of these dextrins is seldom found, and it is customary to refer to the commercial material as dextrine, not dextrin. Dextrines for paste-making are often produced as a thick viscous fluid, with a preservative added. These can be made at about half the cost of dry powder dextrine, since the drying, grinding and sifting are cut out. The bulk of dextrine produced from potato starch is, however, in the powder form. Some of it is little more than soluble potato starch and finds a ready market in the sugar confectionery trades, in which ordinary starch is useless. The production of other grades may have been carried to such a stage that both the sugars maltose and glucose are present in the dextrine. The wide variation in the composition of dextrine is exemplified in the following approximate analysis carried out by the writer on different samples, in which the starch is taken to be that portion which is insoluble in water at a temperature of 15° C. Incidentally, it is generally possible to detect, by the microscope, whether other starches have been used in its manufacture. Starch is ascertained volumetrically, using Fehling's solution, with methylene blue as indicator; the total sugar is then subtracted from the figure for total soluble matter to obtain the percentage of dextrin. This manner of working, although sufficiently accurate for works control tests, gives a high figure for dextrin because it includes any soluble salts added to the starch or derived from the potatoes. The ash normally consists chiefly of mineral matter.

COMPOSITION PER CENT. OF TYPICAL DEXTRINES.

	(1)	(2)	(3)
Starch	2.4	33.1	48.4
Dextrin	54.4	50.2	37.5
Sugar	26.6	3.8	1.5
Ash	1.4	0.7	0.8
Water	14.6	11.9	12.3
	99.4	99.7	100.5

Irrespective of the grade of dextrine manufactured the chemical agent used to modify the starch is invariably hydrochloric acid, and this impregnation with acid is followed by the application of heat. The use of such an agent enables the temperature of dextrinisation to be appreciably lowered, thus making for economy in heating and in processing time, as well as preserving the quality of the product. Given a fixed proportion of acid agent the composition of the resultant dextrine will depend mainly on the period of heating and the temperature, although the initial moisture content of the starch and the presence of phosphatides or salts in the starch will affect its ultimate composition. Because of this it is easier to obtain a dextrine of any desired composition when working from pure potato starch, than with impure starch, for in the latter the impurities, when of an inorganic nature, act as catalytic agents in the modification or degradation of the starch.

Various types of machine are in use for impregnating the starch, hydrochloric acid being added in the proportion of about 0.3 per cent. for pure potato starch, and up to 1.0 per cent. with impure grades. When the acid is used in the form of a solution the mixing of starch and acid may be done in a dry mixing machine. In this case the acid

is diluted to about 10 per cent. strength, and to ensure uniform impregnation an atomiser is used, which, operating by compressed air, projects a fine stray of acid intermittently into the whirling starch. A better method of acidifying the starch has, however, been introduced within the past few years. It is always a difficult proposition to mix evenly a small quantity of liquid with a large amount of powder. Moreover, the dilution of the acid with water, with the object of ensuring more uniform distribution, has a disadvantage in the subsequent heating of the starch, for this added water materially assists in furthering the hydrolysis of the starch to glucose before dextrinisation is completed. To prevent this, and to make the dextrinisation process more easily controllable, the acid, in the form of gaseous HCl, is brought into contact with a thin layer of the starch. The acidification vessel consists of an enamel-lined closed trough in which one or more slowly moving belts convey the starch through the acid atmosphere; a worm gear with vapour-tight inlet and outlet valves conveys starch on to the belts and delivers it from the machine when acidified. The speed of the belt determines the degree of acidification. It is customary to store the impregnated starch, at a temperature of 80° to 85° F., for a few days in copper-lined wooden hoppers having an outlet to atmosphere. These are kept warm by surrounding pipes containing exhaust steam from the dextrinisation vessels. This brief period of warm storage allows excess acid vapour to escape, and reduces the period required for dextrinisation, for tests on the acidified starch show that after a few days' storage a considerable proportion has already been converted to soluble starch, the first stage in dextrine making.

Dextrinising Vessels

Many different types of vessel are used for dextrinising the starch, heated by gas, by circulating oil, or by steam, but their common aim is to ensure a uniform heating of the starch so that a product of even composition shall result. Steam is widely regarded as the most satisfactory and simple medium of heating, for with it overheating is not possible, as it is with gas or with gas-heated circulating oil, because the temperature of the steam cannot rise higher than that predetermined by the pressure used. A type of vessel much employed in Germany is steam-jacketed and of the horizontal cylindrical type (Fig. 7). The vessel illustrated, which is in course of construction in a German works, carries inside the cylinder a series of rotating steam tubes arranged lengthwise, to which is fixed a number of scoops. The powder is kept in constant motion while being heated, by the action of the rotating scoops, thus preventing local overheating. Economy of steam is possible, for it is led first into the rotating internal heater through the hollow shaft of the external driving wheel, then into the jacket of the vessel, and finally it is utilised in warming the storage hoppers. Provision is made on the vessel, by means of valves, so that in the initial stages of the process the preliminary heating of the starch, at about 130° C., can be carried on under a slight pressure of a few pounds above atmospheric. After a short period the pressure is released, the vapour being passed into a water trap to be run to waste. Then the vessel is switched over to a vacuum pump, working in conjunction with a surface condenser, a trap being inserted between vessel and pump to prevent particles of the powder being drawn out of the vessel. The vacuum has the effect of quickly expelling the residual volatile acid from the material. As soon as a moderately high vacuum has been attained, about one inch off absolute, samples are taken by means of valves inserted on the vessel side of the trap. These samples are tested with a few drops of iodine solution, the resultant colour indicating approximately the stage of dextrinisation reached. The product after dextrinising is invariably of a lumpy nature, with a moisture content of about one per cent. To convert it to a marketable product it is necessary to grind and sift it; and also, for economical reasons, to allow it to reabsorb its natural amount of water. This reabsorption is attained, after grinding and sifting, by storing the dextrine in shallow layers for a short period in a moist atmosphere. The grinding and sifting operation occurs in one machine (Fig. 8). In this mill the dextrine falls between a number of rotating beaters and a projecting grinding surface of complementary shape to the beaters. It then passes into the screens, which may be fitted with silk of any desired mesh,

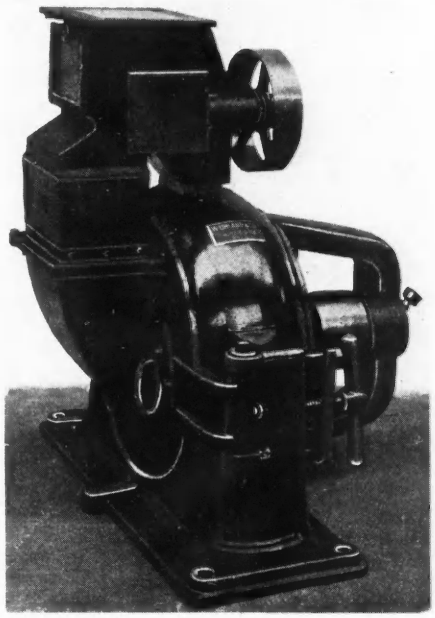

Fig. 8. Dextrine Grinding and Sifting Machine.

the portion not passing the screens going back into the grinder.

The so-called "crystal gum" is a granulated form of dextrine and may be prepared by dissolving an ordinary powder dextrine, of high dextrin content, in hot water. This solution is agitated with about one per cent. of activated carbon and a smaller proportion of a filter aid, filtered, and the filtrate evaporated to a thick consistency, so that when cold it solidifies. The solidified blocks are then broken up and ground to a coarse powder. An alternative method is to acidify a saturated starch solution and heat this in a pressure vessel, as in the manufacture of glucose, but the reaction is arrested before much sugar is formed. The pressure is then released and the solution agitated with decolorising materials, when the procedure is as before. Crystal gum closely resembles the natural gums in appearance and is regarded as the purest form of commercial dextrine; since in the processing it is possible to separate the bulk of the non-dextrinised starch as well as the sugar by careful manipulation of the temperature.

[*To be continued.*]

Institute of Fuel

Award of Students' Medal and Prize

TO encourage the preparation of papers by students of fuel technology, the Council of the Institute of Fuel have decided to make an annual award of a medal, together with a prize to the value of £5. The prize and medal will be awarded for a paper submitted by a student member of the Institute or by a student under 25 years of age of any university or technical college in the United Kingdom. The paper shall deal with some subject relating to the preparation or utilisation of fuel, or allied subjects, and certain subjects for the current year have been suggested by the Papers Committee.

Papers must be received by the Secretary on or before September 1 in any year.

A Chemist's Bookshelf

AN INTRODUCTION TO CHEMICAL SCIENCE, by Professor W. H. Hatcher. London: Chapman and Hall. Pp. viii and 423. 18s.

The outcome of a series of courses in chemistry designed for students of branches of learning other than the sciences, this volume is necessarily treated from an elementary point of view. The author's contention, that there is an utter lack of any one textbook which fulfils his aims—the presentation of all branches of chemical endeavour as they affect human existence—is a little difficult to support, in view, for example, of Findlay's work; but that does not detract from the usefulness of his book. Chemists, as well as non-chemists, may well find it extremely useful for rapid reference, on account of the convenient division into numbered headed paragraphs, each dealing with one single item of subject-matter.

LECTURE DEMONSTRATIONS IN GENERAL CHEMISTRY, by Professor Paul Arthur. London: McGraw Hill. Pp. xvi and 455. 26s.

Books on chemical education of American origin are often distinguished by their utilitarian outlook, and this volume is no exception to that rule. It is, however, not merely utilitarian, but also distinctly useful to any chemist whose work takes him into the lecture-room. It is a complete chemistry laboratory manual for the lecture demonstrator in general chemistry, and more than 1000 experiments are dealt with, grouped under 175 headings.

THERMODYNAMICS AND CHEMISTRY, by Professor F. H. Macdougall; 3rd Edition. London: Chapman and Hall. Pp. ix and 491. 30s.

Thirteen years have elapsed since the second edition of Professor Macdougall's work appeared, and in the intervening period there have been great advances in thermodynamic methods and practices. To meet the requirements of the student of to-day, the text has had to be almost entirely rewritten and much new material added. The nomenclature and rotation correspond, in the main, with modern American practice. A notable addition is the chapter on Mathematical Apparatus, and in the last chapter an attempt is made to acquaint the reader with recent methods of calculating thermodynamic functions with the aid of quantum statistical mechanics, as a check on the proper interpretation of the Third Law.

KINGZETT'S CHEMICAL ENCYCLOPÆDIA, revised and edited by Professor Ralph K. Strong; 6th Edition. London: Baillière, Tindall and Cox. Pp. x and 1088. 45s.

As the foreword to this edition states, "a concise introduction to the most fundamental of all industries" becomes more than ever essential at a time of national emergency, and a new and revised edition of Kingzett is specially welcome in 1940 when the chemical industry is working at full pressure, and often on new lines, in the national cause. Since the appearance of the fifth edition, the original editor, Mr. C. T. Kingzett, died; but before his death he passed on the torch into the eminently capable hands of Sir Gilbert Morgan. Under the stress of ill-health and pressure of work, however, Morgan had to hand over the work to the present editor, who has fully kept up to the standards of his predecessors. Dr. Strong has maintained the original plan and has introduced new subject matter as required. Chemical engineering, physical chemistry, and the statistics of the chemical industry are only a few examples of the sections of the encyclopædia that have received special new treatment. "Kingzett" is an essential part of the industrial chemist's equipment.

ANNUAL REPORTS ON THE PROGRESS OF APPLIED CHEMISTRY, 1939. Vol. XXIV. London: Society of Chemical Industry. 12s. 6d., to members 7s. 6d.

This volume is a widely consulted compendium of international repute, including extracts from all possible sources, such as periodicals, books, patent-literature, lectures. Everything that was published in the last year about scientific, technical and industrial chemistry is reviewed in the 25

(*Continued in next column.*)

Chemical Society Meeting

Advisory Research Council's Work

AT the recent annual meeting of the Chemical Society the President, Sir Robert Robinson, F.R.S., dealt at some length with the activities of the Advisory Research Council of the Chemical Society which was formed last September to act as a liaison between chemists engaged in unremunerated research who are seeking guidance as to subjects for investigation of potential value to the national war effort and Government departments or industrial organisations in a position to suggest such topics. The President said that the response to the suggestions made and invitations issued by the Advisory Research Council had been very gratifying, and he was sure that their initiative would continue to receive the generous support of Fellows throughout the Empire.

"The situation in regard to scientific research in its application to the war," he said, "is very different from that of 1914. This is due partly to the effort made in the Great War itself, partly to the intensive work of the intervening years, and in part to the unexpected course of the present emergency which has not yet thrown up so many new problems as might have been expected. Nevertheless there are clear indications that the original work of research chemists will be needed in the present struggle, possibly to a greater extent than in the past, and the relative slowness of the start should deceive nobody in regard to the vitally important rôle which may be played by our organisation. Certain Research Committees under Government auspices are already showing a marked tendency to make full use of our facilities in connection with the longer-range investigations in which they are interested.

"It has been laid down by the Council that the only subjects to be studied should be such as have a definite relation to the conduct of the present war. It is, however, generally agreed that the maintenance of our export trade in a flourishing condition is of the utmost importance, and therefore we are prepared to assist the chemical industry as far as lies in our power. Here the attack must be on a broad front and, as it is impossible to spot the winners before the race, there must be losers also. Co-operative effort is essential, and this reflection should console those who are unable to see in what way the suggestions made to them could have any influence on the fortunes of the nation. Fellows may rest assured that more urgent needs will be made known to them when they become apparent to the Council, and all suggestions of a specific nature are welcomed and carefully examined.

"The Council does not supervise or direct work undertaken at its suggestion, and the results may be used or published in any way that the investigator desires, subject of course to his own private commitments to firms who may have given material assistance or confidential information. Similarly, it can accept no responsibility for the accuracy of the work or for losses sustained or accidents to personnel. As an advisory body the Council is prepared to give any assistance in its power to investigators who wish to ensure that their work is utilised to the full in the national interest. When work is undertaken on behalf of a Government department, this fact is clearly stated, and Fellows need not be reminded of the existence of the Official Secrets Act. In such cases special conditions are attached and appropriate arrangements are made for reports. It has no funds at its disposal, but workers on projects suggested by the Council may make application at any time to the Research Fund Committee of the Society." Finally, the President emphasised that the Council was always available for consultation if any Fellow was doubtful of the proper procedure at any stage of his work.

(*Continued from previous column.*)

reports included, whose well-known authors give thorough proof of their profound knowledge and the considerable trouble they have taken in compiling them. A very detailed Name Index and Subject Index as well as the many footnotes about the sources used will prove extremely valuable.

NOTES FROM WORKS SAFETY JOTTINGS

The Value of Publicity

By JOHN CREEVEY

THE way in which factory accidents happen is not always evident from a mere review of the circumstances; and when it is known how they happen any such knowledge serves little purpose unless it is applied to the prevention of further accidents of a similar nature. For this reason details of accidents should receive due publicity so that all who share the responsibility of running factories safely may benefit from experience gained. Of course, there is naturally some reluctance on the part of most of us to give details of an accident which has primarily been due to some error or omission in our administrative duties. Yet it is desirable that this be done for the benefit of others who are liable to make similar errors and omissions. It is only by sharing all the experience of others—good and bad—that we, as individuals, can be equipped to the fullest extent in accident prevention.

* * *

In the course of their duties Inspectors of Factories have to devote a large amount of their time to accidents which occur too frequently during industrial operations. The Home Office, however, has made use of the circumstances revealed in the course of official investigation in publishing some of the details in a series of pamphlets under the title of "How Factory Accidents Happen." Each of the accidents included has been an actual occurrence and is described with concise detail in simple language, concluding with a final sentence to indicate the precautions which should be taken to avoid similar consequences. The advice which is given is very sound and of value to employees as well as members of administrative staffs. For this reason it should be read in wise and thoughtful mood and not regarded as just another Government publication printed at the expense of the taxpayer. The accidents with which the pamphlets deal naturally extend over a range of situations and conditions in industry. At random I notice an accident attending the operation of a bottle-washing machine, troubles arising in the stacking of filled sacks, an explosion of an air compressing plant and accidents from the use of hoists and bracket scaffolding. So useful is the information given that there should be no hesitation in obtaining the issues already in print and adding new ones immediately on publication.

* * *

Official publications upon the subject of accidents and their prevention, as well as related cuttings from the trade journals, can usefully be circulated among employees as members of the administrative staffs; alternatively, they should be placed where they may be consulted. Time in working hours should be allowed for this. The man who is actually at work on the plant can have a different viewpoint from that of the administrative staff, and there can be minor features which loom large in his own way of doing things when he is able to read of them. Safety in all factory and works operations, and especially in chemical plant or where there is use of chemicals for industrial processing, is best attained in a measure of co-operation between all employees considered individually, and likewise between employees and administration. There is also much to be done by encouraging ideas upon safety matters not only from the actual plant personnel but also from among those who are about the plant in duties of indirect concern. Among the latter would be any labourers engaged upon occasional tasks such as the removal of accumulated scrap or waste material, lorry drivers who have need to come right into the works from outside, builders' men engaged upon some alteration or addition, etc. To all of them, without exception, the general safety of the works is a matter of concern from which may arise ideas directly affecting their particular work or duties. An idea which is adopted or is of sufficient merit to warrant further consideration might be duly recognised by a small monetary payment to the person from whom it came.

* * *

Every works which considers the welfare of its employees and safety in the works generally, should emphasise this by a poster at each gate so that outsiders who have occasion to come into the works—as well as employees—may be made aware of the fact. Such a poster can be supported by a statement showing the works record in the matter of freedom from accidents.

* * *

The idea of a works safety committee, properly represented from among the employees and presided over by someone in an administrative capacity as safety officer, is also to be encouraged. Meetings can be arranged at regular intervals to discuss general aspects of safety with particular reference to any unsafe practices or hazards which have been noticed or reported. This safety committee can be made responsible for seeing that safety measures are adopted and carried into practice in a conscientious manner and the individual members should be charged with the duty of bringing information to fellow workers in their particular sphere of activities.

* * *

No matter how small the works, someone should be detailed to deal with safety or, better expressed, "accident prevention." In the absence of a full-time safety officer, the man so appointed should be given every facility to become acquainted with the whole of the works routine and methods. No alteration of plant or auxiliary equipment should be made without acquainting him of what is proposed, in order that he may have the opportunity of expressing any views in the matter so far as it concerns keeping the works free from accidents. If a large amount of machinery such as belts and pulleys, bevel gears for the operation of stirrers, electric motors, disintegrating or crushing machines, pumps and compressors, is installed, he should take an early opportunity of paying a visit to the Home Office Industrial Museum in London to see the exhibits and safety features which are there shown. There is always something to be gained by refreshing the mind and memory, and the Home Office Industrial Museum serves its purpose well from the accident prevention aspect. The proper protection of moving machinery and power transmission belting is a matter of great importance as is the proper operation and good working order of lifting tackle. At the Museum the experience of users of machinery is placed before all who seek safer methods, and the staff are ever courteous and ready to help. This museum is a Government concern where good service is forthcoming without fee or favour, and unhindered by red tape.

CONDENSATION OF PHENOL AND ETHYLENE OXIDE

The monophenyl ether of ethylene glycol was first prepared by the reaction between phenol and ethylene oxide in a sealed tube. More frequently, however, it has been prepared by the reaction of ethylene chlorohydrin with a phenol salt. Richard A. Smith (J. Am. Chem. Soc., *62*, 4, 994) now finds that by heating, without rocking, molar equivalents of phenol and ethylene oxide in an autoclave charged with hydrogen at tank pressure for four hours until the temperature reaches 200° C., the pressure at that time being in excess of 2500 lb. per sq. in., and then allowing it to cool and redistilling the product in a vacuum, a yield of 94 per cent. of phenoxy glycol of the same purity as by the former methods is obtained.

Asbestos Roofs

Safety Precautions Essential

ROOFS of asbestos sheets have been causing a steadily increasing number of accidents for many years. Not only is this a comparatively new hazard, but there is reason to believe that the fatality rate must at least have quadrupled since the outbreak of war. Special note is taken of this problem in the *Monthly Bulletin* (*8*, 86) of the National Safety First Association, extracts from which follow.

Unreinforced asbestos sheets are very commonly used as a roofing material. Certain properties easily account for their popularity, including lightness, non-inflammability, resistance to corrosion, and ease of fixing. They have, however, one very serious disadvantage in that they are brittle and require as cautious treatment as a glass roof. While many of the falls through them have been due to ignorance of the brittleness of the material, there have been occasions on which the material has been mistaken for corrugated iron owing to the weather having changed its colour.

The Home Office has repeatedly drawn attention to this danger and during the last nine years for which figures are available there have been 85 fatal and 417 non-fatal accidents on asbestos roofs in factory premises. All these have been due to breakage of the material. Unfortunately, accidents from this cause are increasing, and since the war the number of accidents has increased enormously. Nearly all the pre-war accidents happened to men engaged in repairs on or near roofs. Since the war a large proportion of the increase has been due to men going on roofs in connection with blacking out.

Data for Unreinforced Sheets

British Standard Specification No. 690-1930 gives the water-absorption and acid-solubility tests that should be applied to flat and corrugated sheets. The average transverse breaking load of unreinforced *corrugated* sheets is given as 30 lb. per in. width at a span of 3 ft. 6 in. The test load is applied gradually at a uniform rate not greater than 400 lb. per minute. The weight is applied through a 9 in. by 3 in. plank with the 9 in. face in contact with the sheet. The corresponding average breaking load for unreinforced *flat* sheet, tested wet over a 9 in. span, is (a) for 5/32 in. sheet, 34 lb. when tested parallel to fibres and 48 lb. when tested with fibres at right angles to bearers, and (b) for $\frac{3}{8}$ in. sheet, 196 lb. and 276 lb. respectively.

Roofing material is invariably subjected to impact blows and, although no safety factor has been found in the literature, it is suggested that a factor of 30 would not be too high. It is apparent, therefore, that neither flat nor corrugated unreinforced sheet can, unless closely supported, stand the shock resulting from the sudden placing of even half a man's weight on it.

Reinforced Sheet

There are no similar data for reinforced sheets, which usually consist of either expanded metal or metal sheet, coated with bitumen, and then covered with asbestos material on both sides. The maker of one such material with a basis of sheet steel states that with spans of 5 ft. 6 in. and a 28 gauge core there is no permanent deflection under load. (The safe load is not specified.) Another manufacturer states that there is no risk of fatal accidents from the material becoming brittle and causing men stepping on it to fall through when spans 3 ft. 9 in. for 26 gauge, and 6 ft. 6 in. for 20 gauge, are used.

Many firms are using these sheets and, as far as can be ascertained, no accidents due to falls through them have yet been reported. At the same time many firms take the same precautions for work on roofs of reinforced sheeting as on roofs made of plain sheeting. This is not merely because there has not yet been a very long experience of this type of roof but because of the obvious advantage of using a crawling board to prevent the danger of slipping down the slope of the roof.

Precautions

With the unreinforced sheets it is obvious that closer spacing of supports will reduce the risk of fracture. Failure has, nevertheless, occurred when the span of sheet between supports has been as little as 18 in. with corrugated sheet, and 12 in. with flat sheet. Virtually continuous support, therefore, appears to be necessary to prevent breakage when a person steps on the material. Support can be provided, when a non-inflammable roof is not required, by attaching the sheets to horizontal battens, say, 1 in. thick, nailed 6 in. apart on the rafters, or by boarding the roof previous to sheeting. For a non-inflammable roof, light metal angles can be used in place of wood. Failing some such scheme, it is essential to ensure that no one stands on the sheets. Three precautions are suggested:—

First, the widespread promulgation of a rule that only authorised persons may go on roofs and must obtain separate authority on each occasion. This suggestion is based on the experience that many fatal falls through roofs have happened to people who had no business up there.

Secondly, put up notices at clearly visible points on roofs, such as eaves and ridges, (a) warning against going on the roof without permission, (b) saying that a foot should never be placed on the sheets, and (c) requiring the use of crawling boards.

Thirdly, ensure that a proper supply of such boards is always available and that men are reminded about them whenever they seek authority to go on a roof. These boards should be *at least* 11 in. wide. Two 11 in. boards may be cleated together with advantage after they are in position.

Benzol Recovery

Advisory Committee to be Set Up

THE Secretary for Mines has addressed a letter to all authorised gas undertakings and coking plants drawing attention to the need of recovering the maximum quantity of benzol from carbonising plants. Mr. Lloyd states that the committee set up to report on the possibility of increasing the amount of liquid products obtained by high-temperature carbonisation in gasworks and coke ovens and the most advantageous means of utilising such products in war time, has submitted an interim report. The report, which has been accepted by the Government, shows that a great deal has been done recently to increase the quantity of benzol recovered, for it is estimated that 15 million more gallons of crude benzol will be recovered in 1940 than in 1938. But a further quantity of crude benzol, amounting to some 12 million gallons in a normal year, could reasonably be recovered at gasworks and coke ovens.

The committee has given consideration to the question whether some form of compulsory action was needed, but have concluded that it might reasonably be expected that undertakings would be ready to co-operate to the full and that an appeal should be made with this object. The Government have accepted this recommendation.

In order that the peculiar circumstances of each undertaking, and particularly of the undertakings not at present recovering benzol, may be assessed, the committee have recommended the setting up by the Government of an Advisory Committee containing representatives of both the gas and coke oven industries. At the same time, the committee recommend the appointment of a number of technical officers, men of experience seconded from the two industries, to act as advisers and give assistance to those concerned on their benzol recovery problems. It is hoped to set up the Advisory Committee and appoint the technical officers at an early date.

Annual Report of I.C.I., Ltd., for 1939

Marked Recovery in Sales—Export Rate Well Maintained

THE annual report for 1939 of the directors of Imperial Chemical Industries, Ltd., to be submitted at the thirteenth ordinary general meeting on May 23, states that up to the outbreak of war there had been a marked recovery in industrial activity resulting in increased sales of almost all the company's products compared with 1938; thereafter, sales generally were maintained at a high level at home and abroad. Up to the end of August deliveries of alkali products were well in advance of those for the same period of 1938 and even slightly ahead of the levels of 1937. From September demand in the British market increased substantially and sales for the full year were higher than expected. Export market deliveries up to the end of August, while in advance of those for 1938, were below the 1937 level. In the last three months the rate of export was considerably higher than in the earlier months of the year. The plastic hydrocarbon "Polythene," a new product of high dielectric and other valuable properties, evolved by intensive research, has come into full scale production and, with the growing demand, plant capacity is being increased.

In the dyestuffs group home sales improved substantially owing to increased demand. In addition to the expansion for normal uses, there was a material increase in the requirements of the fighting forces. Steps were taken to meet demands for dyestuffs previously imported.

Both at home and abroad, the volume of sales of the explosives group exceeded that of the previous year. Ardeer factory attained its record industrial explosives output, apart from military demands.

Adverse conditions in agriculture continued during the season and the Agricultural Development Act was passed by Parliament too late to have any effect on the 1939 sales of the Fertiliser and Synthetic Products Group. Sales of nitrogen products for industrial purposes rose sharply and the ground lost during 1938 was fully regained early in the year. The improved demand for plastics resulted in an increased consumption of ammonia, methanol, urea and phenol.

General Chemicals

Sales of almost all products of the general chemical group were higher than in 1938 and in most cases exceeded the high level reached in 1937. Both home and export markets shared in this rise until the outbreak of war when exports receded for a time, although home sales continued to increase substantially. Home deliveries were spread over trade generally, but the requirements of the metal and engineering industries were prominent. The demand from the rayon and paper trades also showed a substantial recovery. Sales of lime were maintained at the same high level as in 1938, while cement sales were considerably higher.

During the first quarter of 1939 sales of metals showed a downward trend, but there was a steady upward movement during the remainder of the year. The rate of production of wrought light alloys in all forms had steadily increased.

The paint group made substantial progress in 1939. Despite difficulties in obtaining certain essential raw materials, production reached a record level, and sales abroad increased. Reduction of the peace-time demand for mouldings by certain trades was more than balanced by new developments for national purposes and by the tendency to extend the use of plastics wherever possible. As a result of the plastics group's sales of moulding powders reached a record high level during the year. The volume of sales of the salt group during the year was substantially in excess of 1938.

During the earlier part of 1939 several new plants were completed and extensions made to existing units. All of them were now operating satisfactorily. The total capital expenditure of the home operating groups amounted in round thousands to £2,484,000.

In addition to maintaining an extensive range of dyestuffs and auxiliary products at a competitive standard, research had led to the introduction of new dyestuffs for the leather dyeing, vat dyeing and colour photography trades. Alternative makes had been devised to replace dyestuffs and other organic chemicals previously imported from Germany.

The number of employees in Great Britain reached a total of approximately 75,000 at the end of the year as compared with 65,000 a year ago. These totals did not include servants of the company now with H.M. Forces, numbering over 6000 at the end of the year.

Export and Dominion Trade

The general trend of export business up to the outbreak of war compared favourably with 1938 in nearly all classes of goods. Japanese competition in alkali products was comparatively unimportant owing to the situation in the Far East, while the special methods adopted by Germany to expand her export trade were having only limited success. Exports generally were well maintained for the remainder of the year, with prospects in many cases of further progress.

Imperial Chemical Industries of Australia and New Zealand, Ltd., and its constituent companies continued to make progress and consolidated sales were ahead of those of the previous year. The completion of the alkali works near Adelaide and of the synthetic ammonia plant at the industrial explosives factory near Melbourne had been delayed by late deliveries of plant from this country. Production of alkali had now begun and the ammonia plant was scheduled to start this month. A new company had been formed in conjunction with Messrs. Albright and Wilson, Ltd., for the manufacture near Melbourne of phosphoric acid and phosphates, and production was expected to begin during the latter part of 1940. Another new company representing the first extension of manufacturing interests to New South Wales, has been formed, jointly with Broken Hill Proprietary, Ltd., for the production of chemicals at Newcastle.

Business showed an upward trend in all the manufactures of Canadian Industries, Ltd. The company had an excellent year. A modern paint works was nearing completion at Montreal. The coated textile plant had been completely overhauled and the equipment renewed where necessary. The electrolytic chlorine factory at Shawinigan Falls had been expanded.

In the first eight months of 1939 a marked improvement in trade took place in India and sales of the company's products benefited accordingly. The war gave a further stimulus to demand, and the main problem was then to ensure the movement of adequate supplies. Although the construction of the alkali factories of the Alkali and Chemical Corporation of India, Ltd., was inevitably interfered with in the early months of the war, work had continued actively and the chlorine works near Calcutta were expected to commence production early in 1940. It was hoped that the soda plant in the Punjab will be completed early next year.

South American Trade

Export trade with South America for the year was good and in China trade in general recovered to figures only slightly lower than in the period immediately preceding the Sino-Japanese hostilities. In Japan Government control reached the stage where imports consisted almost entirely of essential raw materials. Local output of heavy chemicals met the demand during the past year, but imports of alkalis and sulphate of ammonia might have to be made in 1940. Sales by I.C.I. (Malaya), Ltd., again advanced.

The consolidated balance sheet and income statement reveals that consolidated manufacturing and trading profits increased from £9,023,293 to £13,701,248. Consolidated income increased from £7,281,742 to £7,678,413.

Personal Notes

MR. GEOFFREY LLOYD, former Secretary for Mines, has been appointed Secretary for Petroleum in the new Government.

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DR. T. A. HENRY was recently presented with a gift from the Wellcome Foundation on his completion of 21 years' service as Director of the Wellcome Research Laboratories.

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The Council of the Royal Society of Arts has awarded a prize of £12 10s., under the Thomas Gray Memorial Trust, to DR. S. C. BLACKTIN, of Leeds, for his Direct View Particle Counter and Portable Ultramicroscope.

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MR. F. W. WHITEHOUSE, who has been appointed manager of the pattern and foundry shops of Messrs. Howden and Co., Ltd., Glasgow, was for nine years foundry manager at the Thorncliffe Iron Works of Newton Chambers and Co., Chapeltown, near Sheffield.

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AT the ANNUAL MEETING of the Association of British Insecticide Manufacturers held on May 8, the following officers and Executive Committee were elected for the year 1940/41: Chairman, MR. L. F. BRAGA (Plant Protection, Ltd.); honorary treasurer, MR. H. J. JONES (Hemingway and Co., Ltd.); honorary auditor, MR. R. A. BLAIR (Burt, Boulton and Haywood, Ltd.); executive committee, MR. R. A. BLAIR, MR. W. V. BLEWETT (I.C.I., Ltd.), MR. E. Z. BOLT (G. H. Richards, Ltd.), MR. R. V CRAVEN (W. J. Craven and Co., Ltd.), MR. J. S. MITCHELL (The Murphy Chemical Co., Ltd.), DR. J. H. REID (The British Nicotine Co., Ltd.); secretary, MR. J. DAVIDSON PRATT, 166 Piccadilly, London, W.1.

OBITUARY

DR. WILLIAM BLACKADDER, Professor of Engineering at Aberdeen University, died last Tuesday at Aberdeen, aged 68.

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MAJOR JAMES HOLDEN CROSSLEY, managing director of Godfrey Woodhead and Son, Ltd., chemical manufacturers, of Slaithwaite, died last week at Linthwaite, near Huddersfield, aged 73.

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MR. JOSEPH JOHN CROSFIELD, sometime chairman of Messrs. Joseph Crosfield and Sons, Ltd., chemical and soap manufacturers, of Warrington, a subsidiary company of Lever Bros. and Unilever, Ltd., died last week at Romsey, Hants, aged 74.

New Control Orders

Iron and Steel Scrap

A DIRECTION has been issued under the Control of Iron and Steel (No. 7) (Scrap) Order, 1940, increasing the maximum prices per ton for scrap iron and steel by amounts varying from 6d. to 1s. 6d. a ton. These increases are designed to compensate sellers of scrap delivered by rail for the increases in railway rates. The price of scrap c.i.f. ports or wharves remains unaltered.

Goods from Belgium and Holland

The Board of Trade have, as a temporary measure, issued an Open General Licence authorising, until further notice, the importation without further licensing of all goods consigned to the United Kingdom from Belgium and Holland, except arms and ammunition, dyes and dyestuffs, and plumage. For the time being they also suspended the requirement of certificates of origin and interest for all goods consigned from the above-mentioned countries.

Copper Aceto-arsenite

The Board of Trade have made an Order under which the export of copper aceto-arsenite (Paris green) to any destination on and after May 17 will be permitted only under licence issued by the Export Licensing Department.

Export Groups Formed

Fine Chemicals

AT a meeting of members of the A.B.C.M. held on May 1 a Fine Chemical Export Group was formally inaugurated and this has now received the recognition of the Export Council of the Board of Trade. Firms who are interested can obtain full particulars on application to the Association at 166 Piccadilly, London, W.1.

The Chairman of the Group and of the Executive Committee will be Maj. T. Knowles (Monsanto Chemicals, Ltd.) and Mr. T. D. Morson (Thomas Morson and Son, Ltd.) will be vice-chairman. Mr. R. Murdin Drake has been appointed secretary-manager of the group and will operate from the above address. The executive committee will consist of Mr. G. E. Howard (Howards and Sons, Ltd.), Dr. P. C. C. Isherwood (W. J. Bush and Co., Ltd.), Maj. T. Knowles (Monsanto Chemicals, Ltd.), Mr. T. D. Morson (Thomas Morson and Son, Ltd.), Mr. C. L. Saul (Boots Pure Drug Co., Ltd.) and Mr. G W. Startin (Albright and Wilson, Ltd), together with the General Manager of the A.B.C.M. as an *ex officio* member.

Heavy Chemicals

AN EXPORT GROUP for the Heavy Chemical Industry has likewise been established. The Chairman is Mr. E. Wallace (Imperial Chemical Industries, Ltd.), president of the Association of British Chemical Manufacturers. The other members of the executive committee of this Group are Mr. Kenneth H. Wilson (Albright and Wilson, Ltd.), Mr. L. P. O'Brien (B. Laporte, Ltd.), Mr. W. J. U. Woolcock (Imperial Chemical Industries, Ltd.), and Mr. S. P. Leigh (Imperial Chemical Industries, Ltd.). Mr. Leigh will also act as secretary of the Group which will operate from Imperial Chemical House, Millbank, London, S.W.1.

British Chemical Prices

Market Reports

DURING the past week values throughout most sections of the general chemical market have remained firm and quotations for quite a number of items display a strong upward tendency. A fairly active market is reported for available supplies of oxalic, citric and tartaric acids and for bichromates, whilst there is a good demand for salammoniac. A fair volume of export inquiry is in circulation. Comparatively quiet conditions prevail in the market for coal tar products the volume of fresh business being limited by the supply position. Ex-contract deliveries, however, are proceeding along satisfactory lines. Prices on the whole are unchanged.

MANCHESTER.—In spite of the fact that the usual Whitsun holidays in the Manchester district had not been observed to anything like their normal extent trading conditions on the chemical market during the past week have been quieter, both as regards the general movement into consumption and the amount of new business booked. Those consuming trades that are closely connected with the national war effort, however, have been calling for good contract deliveries. Firm price conditions continue to rule almost throughout the market. In the by-products section the light products are still the most active and values are well maintained, as are also quotations for pitch and the naphthalenes. Carbolic acid, however, is easy in tendency.

GLASGOW.—Normal trading conditions have been experienced in the Scottish heavy chemical market during the past week, but the advertised increase in rail rates of 10 per cent. with which coastal freights have risen in sympathy, is responsible for all round advances in prices. In addition, increases have been noted in sulphuric acid and sodium chlorate. The shortage in packages is acute and great efforts are being made to secure the return of all kinds of packing. Considerable activity is evident in the glucose, starch and dextrine markets. Rubber trade chemicals are also in considerable demand.

Price Changes

For the latest complete list of chemical prices, see THE CHEMICAL AGE of May 11.

Cresylic Acid.—99/100%, 2s. 8d. to 3s. 3d. per gal., according to specification. MANCHESTER: Pale, 99/100%, 2s. 9d.

Carbolic Acid.—MANCHESTER: Crystals, 10½d. per lb., d/d; crude, 3s. 6d. naked, at works.

Pitch.—MANCHESTER: 55s. f.o.b. East Coast.

General News——From Week to Week

DICKINSON AND SON are making extensions to their chemical works at Oswaldtwistle.

THE PETROLEUM BOARD announces that the price of pool bitumen is increased by 32s. 6d. per ton. The average yield was 95s. per ton.

COLAS PRODUCTS, LTD., recently returned to their London offices at Norman House, 105-109 Strand, W.C.2 (Telephone: TEMple Bar 0011).

THE QUASI-ARC CO., LTD., of Thames House, London, S.W.1, and the Ferro-Arc Welding Co., Ltd., have amalgamated under the former title.

R. G. HARBOTT AND CO., manufacturing chemists, Sebert Road, London,E.7, are considering plans for building a new factory and offices in the neighbourhood.

AN AUCTION SALE of chemical manufacturers' machinery, plant and stock will take place at the premises of Compact Chemicals, Ltd., Hillington Road, Scottish Industrial Estate, Hillington, Glasgow, on May 22.

IT IS ANNOUNCED that, subject to the Treasury's approval, a £1,000,000 loan will be floated for the launching of an important new industry in Scotland. Plastic and other moulded products for the aircraft and building industries will be manufactured by the company under consideration.

ACCORDING TO THE BOARD OF TRADE RETURNS for the month ended April 30, imports of chemicals, drugs, dyes and colours into the United Kingdom were valued at £1,758,729, an increase of £436,274, as compared with April, 1939. Exports were valued at £3,189,043, an increase of £1,374,276. Re-exports amounted to £88,459. These figurss play an important part in making the total exports for the month the highest since July, 1930.

DRUGS, SOAP, AND MATCHES are included in the list of goods brought under the price regulation machinery of the Prices of Goods Act, under a Board of Trade Order which comes into force on June 10. Furthermore, so far as their prices are not otherwise controlled, the Act will be applied to the more important classes of materials needed for the manufacture of the above-mentioned goods. The Act exempts goods intended for export.

Foreign News

AMERICAN CADMIUM OUTPUT of the Anaconda Mining Co. in 1939 was 986,304 lb., a very high level.

POTATO TOPS ARE RECEIVING ATTENTION in Germany as an emergency source of cellulose for the rayon and paper industries. Preliminary trials have been encouraging.

A NEW TECHNIQUE FOR ESTIMATION of iodine value of fats evolved by H. P. Kaufmann does not involve the use of iodine or potassium iodide (*Fette und Seifen*, 1940, 4).

THE FOLLOWING SUBSTANCES AND THEIR ANALOGIES have been found effective as softeners for transparent wrapping material of the regenerated cellulose type and may be of interest at the present time as substitutes for glycerol: butylene glycol monocarbamate; triethanolamine lactate; diethanolamine glycollate; diethanolamine formate. This application is covered by U.S. Pats. 2,191,894-897 (E.I. du Pont de Nemours and Co.).

REYMERSHOLMS GAMLA INDUSTRI A/B, Hälsingborg, Sweden, reports that its sulphuric acid capacity was increased in 1939 through extensive plant additions. Production increased by 6 per cent. at the chemical factories in Hälsingborg and Stockholm, which turned out 54,793 tons of sulphuric acid (basis 100 per cent. pure), in 1939 compared with 51,757 tons in 1938. A factory having an output of 12,500 tons of sulphuric acid (100 per cent.) is expected to be completed this month.

THE SANITARY WORKS DEPARTMENT of the Argentine Government has continued to produce the "Dusi" type of aluminium sulphate from Brazilian bauxite, according to a report in "World Trade Notes." While the 1938 output amounted to 24,459 tons of liquid and 871 tons of solid, production during 1939 shifted to approximately 22,000 tons of the solid and only 5000 tons of the liquid. A commercial plant for aluminium sulphate was opened last January by the firm "Duperial."

TO REPLACE SUPPLIES HITHERTO IMPORTED from Germany, etc., bone glue and hide glue, as well as gelatine in plain sheets or powder, are required by Indian match factories to an amount of 300 tons annually. Pre-war price for gelatine is reported at £37 per ton, and for hide glue £60 per ton, c.i.f., Calcutta.

REPORTS FROM CHILE indicate increased production of sodium nitrate. A rise for January last was reported at the large nitrate plants of Maria Elena and Pedro de Valdivia. The Santa Laura plant in the Iquique district resumed production in the same month after 10 years' inactivity. The capacity of this plant is about 3000 tons monthly. Preparations have been made for reopening the Brac plant in the Iquique district which has also been inoperative for some years. It is expected to produce at the rate of about 8000 to 9000 tons monthly, employing the Shank's process.

IN THE CHEMICAL DEPARTMENTS of the Compagnie des Produits Chimiques et Electro-Métallurgiques Alais, Froges et Camargue, new extensions have been made in several manufactures, including alumina, fluoric products, bromine, magnesium, glucinium (*i.e.*, beryllium), and various chlorine products. During the eight months ending August, 1939, sales of aluminium in France developed favourably, increasing by about thirty per cent., as against the corresponding period of 1938, owing to the fact that the price fixed by the National Committee for Price Surveillance was below that ruling in foreign markets. Export sales were maintained.

THE DOMINION WATER AND POWER BUREAU, Department of Mines and Resources of Canada, has issued its annual review of the water-power resources of Canada, dated March 15. This review supplies information in condensed form on the total available and developed water power in each province, the provincial distribution of water power, its development in connection with the central electric station industry, the pulp and paper industry, the mineral and other industries. Copies may be obtained free of charge from the Controller of the Dominion Water and Power Bureau, Department of Mines and Resources, Ottawa, Canada.

THE MINISTRY OF COMMERCE AND INDUSTRY of Portugal, it is announced, will issue a decree creating a new organisation of economic co-ordination which is to be called the Regulating Committee of Chemical and Pharmaceutical Products. It will consist of three groups dealing respectively with medicinal and pharmaceutical specialties; fertilisers and other agricultural chemicals; and drugs and miscellaneous products, including dyes, varnishes, glue, and explosives. The committee is to be established to prevent speculation in chemical and pharmaceutical commodities and to ensure normal supplies to the domestic industry, and it is empowered to control imports, fix prices, and regulate all activities relating to the chemical and pharmaceutical industries.

THE NIPPON KAYAKU SEIZO K.K. (Japan Powder Manufacturing Co., Ltd.) is to establish a subsidiary company in China under the title Shin Kayaku Seizo K.K. (New China Powder Manufacturing Co., Ltd.) with a capital of 1,500,000 yen, of which half will be paid up. The company will take over the arsenal formerly owned by the Kuomintang Army at Tsinan. Since the greater part of the arsenal was destroyed in the fighting, it will be completely re-erected and re-equipped. Work is expected to be completed by the end of the year, and operations should start next spring. The plant will not only manufacture powder, but will also exploit various mines in the locality. The company's new factory at Taiyuan has been completed, and another factory is being erected at Mukden, Manchukuo.

Forthcoming Events

THE ANNUAL MEETING of the Hull Chemical and Engineering Society will be held in the Lecture Room at the Hull Subscription Library, Albion Street, Hull, on May 21, at 7.30 p.m.

THE TWENTY-FIRST ANNUAL MEETING and dinner of the Chemical Engineering Group, Society of Chemical Industry, will be held on May 23, at the Waldorf Hotel, Aldwych, London, W.C.2. The annual meeting in the Conference Room at 6.45 p.m., will be followed by the dinner (7.15 for 7.30), after which Lord Leverhulme will address the company.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

ALLIED GUANO AND CHEMICAL CO., LTD., Knebworth. (M., 18/5/40.) May 3, charge, to Barclays Bank, Ltd., securing all moneys due or to become due to the bank; charged on property at Knebworth. *Nil. January 3, 1940.

LIVINGSTON REFRACTORIES, LTD., London, E.C. (M., 18/5/40.) April 30, £6000 first debentures and £6000 second debentures; general charge. *£15,000. January 11, 1940.

RUNCOLITE, LTD., London, W., manufacturers of resins. (M., 18/5/40.) May 6, series of £10,000 debentures, present issue £6000; general charge. *Nil. March 6, 1940.

XELEX PRODUCTS, LTD., London, W., dealers in plastic materials, etc. (M., 18/5/40.) May 6, £1350 debentures, part of a series already registered.

Satisfactions

GIBSON BROS. (HULL), LTD., paint manufacturers. (M.S., 18/5/40.) Satisfaction May 4 of debentures registered January 5, 1911, to the extent of £950.

County Court Judgments

RELEGEN, LTD., R/O, 32 York Road, Battersea, chemical apparatus dealers. (C.C.J., 18/5/40.) £10 10s. 9d. March 29.

Company News

British Drug Houses, Ltd., report a trading profit for 1939, after taxation, of £109,769, an increase of £44,377 compared with 1938.

The Niger Co., controlled by Lever Brothers and Unilever, Ltd., report profits for 1939 of £1,076,784, an increase of £890,219. A dividend of 6 per cent., tax free, is to be paid.

The British Thermostat Co., Ltd., earned a net profit of £63,978 (£31,585) for the year ended January 31, 1940. A final dividend of 11 per cent., making 18½ per cent., less tax, has been declared, as last year.

Boots Pure Drug Company, Ltd., report a net profit in the year to March 31 last of £782,467, the highest since 1936-37, and £6175 more than the net figure in 1938-39. In addition to the four quarterly interim dividends already paid, amounting to 24 per cent., less tax, to holders of ordinary shares, it is recommended that a bonus of 4.1379d. per 5s. ordinary share, less tax, be paid on June 30. This bonus, which compares with 5 per cent., tax free, paid in the previous year, is the maximum payable in accordance with the Chancellor's pronouncements on the limitation of dividends.

New Companies Registered

S. Stonier, Ltd. (361,125).—Private company. Capital £500 in 500 shares of £1 each. To acquire the business of a chemical manufacturer and merchant, carried on at Congleton, Ches., by S. Stonier. Subscribers: Arthur J. Corbett, 35 Woodlands Road, Moseley, Birmingham, and Percival J. Wall. Solicitors: Pinsent & Co., 6 Bennetts Hill, Birmingham.

British Peat and Charcoal, Ltd. (360,944).—Private company. Capital: £100 in 100 shares of £1 each. Producers are marketers of charcoal and other products from peat and other natural resources, etc. Subscribers: John R. Hoole and Bernard Franklin. John R. Hoole is the first director. Registered office: 57/8 Chancery Lane, W.C.2.

Herts. Oil & Chemical Company, Ltd. (361,189).—Private company. Capital £100 in 100 shares of £1 each. Manufacturers, producers, distillers, refiners and importers of and dealers in oils, lubricants, chemicals, greases, tallow, petrol, paraffin, benzol, motor spirits, tar, bitumen, petroleum, wax, beeswax, oil fuels and liquid and other fuels, etc. Directors: Cyril H. Hall, 8 Watling Street, Radlett, Herts, and Robert D. Connell.

Acme Plastics, Ltd. (360,941.)—Private company. Capital: £500 in 400 6 per cent. cumulative preference and 100 ordinary shares of £1 each. Manufacturers, exporters, importers, wholesalers and retailers of, agents for and dealers in plastic materials, ebonite, resins, gutta percha, vulcanite, rubber, balata, cotton and silk, chemists and druggists, etc. Permanent directors: Bernard Ackerman and Harry Rose. Solicitors: H. Davis & Co., 42 Brook Street, W.1. Registered office: 32 London Wall, E.C.2.

Alancurt Products, Ltd. (360,975).—Private company. Capital: £100 in 100 shares of £1 each. Manufacturing and analytical chemists and druggists, manufacturers of and dealers in oils, lubricants, candles, night lights, greases, tallow, petrol, paraffin, benzol, motor spirits, tar, bitumen, petroleum, wax, beeswax, oil fuels, and liquid and solid fuel of all descriptions, oil brokers, merchants, factors, blenders, boilers, refiners, distillers, etc. Subscribers: Ellis P. White, Kurt M. Lenczinski. Ellis P. White is the first director. Registered office: 27 Newington Causeway, S.E.1.

Chemical and Allied Stocks and Shares

THE acceleration of the war has been followed by an all-round marking down of security values, but under the lead of British Funds, the tendency became firmer when it was apparent that no heavy selling was likely to develop. As was to be expected, the volume of business was extremely small, and quotations for many shares did not appear to be tested by dealings.

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In accordance with the prevailing trend, securities of companies identified with the chemical and kindred industries were lower on balance. Imperial Chemical, however, were assisted by the excellent impression created by the full results, and at 31s. 1½d. were within a few pence of the price ruling a week ago, while the preference units at 32s. 4½d. were well maintained. British Oxygen, British Aluminium, Cerebos and Reckitt and Sons' ordinary were among shares which were marked down. On the other hand, Borax Consolidated deferred were steady around 28s. 9d. and Dunlop Rubber, following an earlier reaction, showed a partial recovery to 33s. 3d. British Glues at 7s. and General Refractories at 9s. 3d. are well maintained at the time of writing. Lever N.V. and Lever and Unilever declined heavily on the invasion of Holland; the full results and statements at the annual meetings are awaited for indications as to how the group will be affected by the changed conditions arising from the war. Iron and steel securities were lower under the influence of the prevailing market trend, although it is generally believed that, with few exceptions, dividend payments are likely to keep around the maximum amount ruling in the pre-war standard period.

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Results of Barry & Staines created a good impression, but the shares were lower at 25s. 7½d., due partly to deduction of the dividend from the price. Michael Nairn were slightly lower at 56s. 3d. United Molasses had a relatively steady appearance at 25s., as had Turner and Newall at 64s., sentiment being aided by the fact that both companies have a favourable pre-war dividend standard. B. Laporte ordinary were inactive and continued to be quoted at 66s. 3d., while Greeff-Chemical Holdings 5s. units at 5s. 7½d. were also the same as a week ago. Blythe Colour Works 4s. shares were around 8s. 3d., while business in Morgan Crucible first preference was recorded at 23s. 9d. Fison Packard ordinary changed hands at 39s. 9d. Pinchin Johnson were 20s. 3d. and International Paint went back to 80s., but as in most other directions, very little selling was reported, and the lower prices were attributed mainly to absence of demand this week. Buyers were again in evidence for British Oil and Cake Mills preferred ordinary, which were firm at 42s. 9d., but elsewhere, Imperial Smelting moved down to 11s. 3d. There was a fair amount of activity in Low Temperature Carbonisation 2s. units, which were quoted at 1s. 7½d. British Plaster Board 5s. shares attracted some attention around 9s. 3d.

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Satisfaction with the dividend resulted in a better tendency in Boots Drug at around 38s. following an earlier decline. Beechams Pills deferred were firm at 8s. xd., the distribution being rather higher than had been expected in some quarters of the market. The Timothy White results also created a satisfactory impression, and the 5s. shares were quoted at 24s. 6d. Sangers 5s. ordinary had a firm appearance at 22s. 4½d. British Drug Houses kept around 23s., and William Blythe 3s. ordinary shares were again quoted at 6s. 6d., while Goodlass Wall, which remained under satisfaction with the maintenance of the dividend, were again 9s. 6d. Monsanto Chemicals 5½ per cent. preference shares kept at 22s. 6d. "middle." Wall Paper Manufacturers deferred units rallied, and at 15s. were unchanged on the week. Textile shares were reactionary in accordance with the general trend on the Stock Exchange, but some attention was given to British Celanese second preference on the belief that steady progress is likely to be made in paying the dividend arrears on these shares.

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Oil shares were marked down sharply; there has been a very heavy fall in Royal Dutch in view of the invasion of Holland.